REMARKS

I. Introduction

Reconsideration and allowance are respectfully requested. The Applicants thank the Examiner for the examination to date.

Claim 1 has been amended to more clearly recite the structural configuration of the claimed membrane electrode assembly. Specifically, claim 1 has been amended to more clearly recite direct separator/cathode and direct separator/anode contact. Exemplary support for this amendment can be found in the Specification at, for example, para. 22 (para. 24 of the published application) which describes the separator as being adjacent to and in substantial contact with the cathode, and describes the anode as being adjacent to and in substantial contact with the surface of the separator opposite the cathode. As such, this amendment raises no issues of new matter.

Claim 75 has also been amended to more clearly specify that the cathode and anode catalytic materials comprise admixtures of catalyst components and ion conducting materials. Exemplary support for this amendment is found in the Specification at Example A (Electrode Preparation) which describes mixing Pt (i.e., a catalyst component) with a 5 wt. % Nafion 1100 EW solution (i.e., an ion conducting material) with deionized water and polymer coated magnetic particles. These components were admixed in a vial clamped in the bit of a variable speed drill at 2000 rpm for 30 seconds, with the resulting mixture applied to the cathode and anode surfaces. As such, this amendment raises no issues of new matter.

Claims 1-4, 6, 39-40, 48-54, 56, and 73-75 are under consideration. Applicants request reconsideration in light of the amendment and the arguments below.

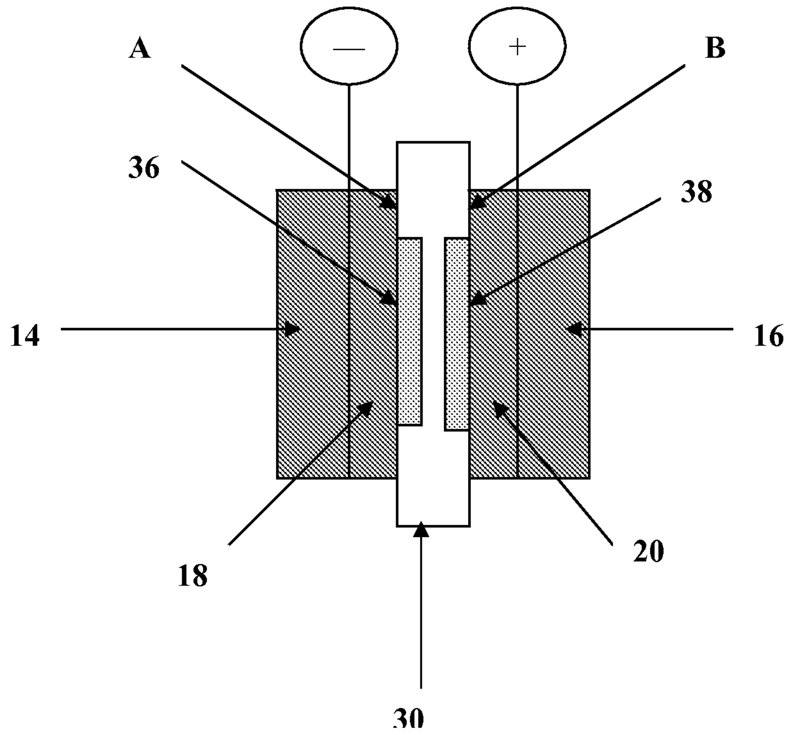
II. Rejections Under 35 U.S.C. § 103(a)

A. Independent claim 1 is non-obvious

Claims 1-3, 4, 6, 39-40, 48, 54, and 73-75 stand rejected under 35 U.S.C. § 103(a) for allegedly being unpatentable over Voss et al., U.S. Pat. No. 5,441,819 ("Voss") in view of Dhar, U.S. Pat. No. 5,242,764 ("Dhar"). Claims 1-3, 6, 39-40, 48, 54, and 56 stand rejected under 35 U.S.C. § 103(a) for allegedly being unpatentable over Voss in view of Biegert et al., U.S. Pat. Appn. No. 2004/0241531 ("Biegert"). Claims 49-53 stand rejected under 35 U.S.C. § 103(a) for allegedly being unpatentable over Voss in view of Biegert et al. Claim 56 stands rejected under 35 U.S.C. § 103(a) for allegedly being unpatentable over Voss in view of Dhar in further view of Biegert et al. Applicants respectfully traverse.

Claim 1 is the sole pending independent claim and is directed to a membrane electrode assembly with the following components: (i) a cathode; (ii) a separator; and (iii) an anode. Claim also requires that catalytic materials are on a portion of the surfaces of the cathode and anode which are adjacent to and in contact with the separator. As described above, claim 1 has been amended to more clearly indicate that the portions of the same anode and cathode surfaces which do not have catalytic materials are in direct contact with the separator, and that areas of direct contact are opposite of each other across the separator. An example of this arrangement was shown schematically as Figure I in the Amendment submitted April 22, 2011. This Figure is reproduced below for the Examiner's convenience.

Figure I



Applicant notes that features common to Figure I and Applicant's Figure 2 in the Specification are labeled with the same numerical labels. These include the anode (**18**), anode-side layer of catalytic material (**36**), separator (**30**), cathode-side later of catalytic material (**38**), and cathode (**20**). However, certain other features required by the instant claims (and shown in Figure I) are not seen in Applicant's Figure 2 in the Specification. For example, the direct opposing contact of portions of the cathode and anode the separator (i.e., at portions of the cathode and anode without catalytic materials) are shown in Figure I at locations **A** and **B**.

Applicant submits that the claimed membrane electrode assembly with direct and opposite contact between the cathode/separator and separator/anode are not described or suggested, either expressly or inherently, by Voss, Dhar, or Biegert.

Voss does not disclose or suggest direct contact between the cathode and separator opposite direct contact between the separator and anode

As previously argued, Voss describes a membrane electrode assembly where the anode and cathode are "provided with a coating or layer of catalytic material." Voss does not indicate that these catalytic material layers cover less than the entire facing surface of the anode and cathode. In reply, the Examiner contends that Voss uses porous carbon fiber sheets as cathode and anode, and that a catalytic material layer/coating on such a porous material "may not be uniformly and integrally formed over the entire porous surface of the carbon-based sheet." Office Action mailed June 24, 2011, p. 16. The Examiner then concludes that Voss' electrode structure "may have gaps equivalent to Applicant's portions in which the anode and cathode structure contacts the separator while also having majority of electrode's surface areas coated with catalytic materials." Id.

Thus, the Examiner appears to assert that the claim requirement of direct contact between the cathode/separator and separator/anode is inherently found in Voss' structure. Applicant respectfully disagrees. To establish inherency, extrinsic evidence may be considered but the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 U.S.P.Q.2D (BNA) 1746, 1749 (Fed. Cir. 1991), emphasis added. Further, "[i]nherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *Id.* at 1269, 20 U.S.P.Q.2D (BNA) at 1749 (quoting In re Oelrich, 666 F.2d 578, 581, 212 U.S.P.Q. 323, 326 (C.C.P.A. 1981).

The Examiner has cited no evidence which demonstrates that coating Voss' carbon fiber electrodes with a catalytic material necessarily results in uncoated portions of the anode and cathode contacting the separator. As such, Applicants respectfully submit that the Examiner has not met their burden to establish inherency of this limitation.

Additionally, the Examiner seems to have overlooked the limitation in claim 1 which requires that the portion of direct contact between the cathode/separator and portion of direct contact between the separator/anode are opposite each other. Thus, even assuming *arguendo* that Voss' electrodes do inherently have portions of the cathode and anode which directly contact the separator, there is nothing in Voss to suggest, nor does the Examiner assert, that "irregular and non-integral patterns of catalyst coating layer" on either side of the separator will necessarily align such that portions of direct contact with the anode will be opposite portions of direct contact with the cathode.

Therefore, Applicant respectfully submits that the Examiner's reliance on Voss as inherently teaching the direct and opposite cathode/separator/anode contact required in the instant claims is improper.

Dhar's separator does not directly contact a portion of the cathode and anode

The Examiner again points to Figure 2 of Dhar as allegedly demonstrating applicants' specific separator/cathode/anode/catalyst configuration, and again characterizes Figure 2 from the Specification as "Applicant's apparent structure." However, a comparison of Figure 2 of Dhar and the features shown in Figure 2 of the Specification is incomplete with respect to the requirements of the pending claims. As described above, the pending claims require features not shown in Figure 2 of the Specification. In particular, Applicant points to **A** and **B** of Figure I, above, as exemplifying the direct contact between the separator and portions of the cathode and anode not covered by catalytic material.

This structural feature facilitates water transport across the separator by providing locations where water transport is unimpeded by the presence of catalyst materials. Such an arrangement is absent from Figure 2 of Dhar.

Dhar does, however, show an oversized membrane that extends slightly beyond the anode and cathode. The Examiner contends that the portion of the separator that extends beyond the anode and cathode demonstrates the requirement of claim 1. As amended, claim 1 requires direct contact between the separator and the cathode and between the separator and the anode. The portion of Dhar's separator that extends beyond the cathode and the anode does not directly contact the cathode and anode. Thus, Dhar does not teach or suggest a separator that directly contacts the cathode and the anode as required by the instant claims.

Biegert's separator does not directly contact a portion of the cathode and anode

The Examiner also again points to Figure 1 of Biegert as allegedly demonstrating a separator contacting the anode and cathode without contacting the respective anode and cathode catalyst layers. As described above, amended claim 1 requires that a portion of the separator directly contact the cathode and anode; that is, without contacting the respective catalyst materials. Applicant respectfully submits that Biegert also fails to teach or suggest this feature.

Figure 1 of Biegert is similar to Figure 2 of Dhar in that it shows an oversized membrane that extends slightly beyond the anode and cathode. As shown in the exemplary cross-section of Biegert's fuel cell in Figure 1, catalyst layers (**4**) are shown covering the entire anode (**6**) and cathode (**7**) surfaces facing the separator. Further, Biegert makes no hint that these catalyst layers may cover less than the entire facing surface of the anode (**6**) and cathode (**7**).

As such, Biegert does not teach or suggest a separator with a portion that directly contacts the anode and cathode.

Therefore, Voss, Dhar, and Biegert, alone or in combination, fail to describe a separator with a portion contacting the anode and cathode but not contacting the catalytic materials thereon, as required in the instant claims. Accordingly, Applicants respectfully request that the obviousness rejections be withdrawn.

B. Dependent claim 75 is non-obvious

In addition to the reasons described above, claim 75 is further distinguished over Voss and Dhar. As indicated above, claim 75 has been amended to more clearly indicate that the cathode and anode catalytic materials each comprise an admixture of at least one catalyst component and at least one ion conducting material. Neither Voss nor Dhar describe such an admixed catalytic material.

Voss describes coating an anode and cathode with a catalytic material to form a catalytic layer. See Voss, col. 7, lines 60-62. No materials (including an ion conducting material as required by instant claim 75) are contemplated as being admixed with the catalytic material in the formation of the catalytic layer.

The Examiner has asserted that mixing of a catalyst material and an ion conducting material inherently occurs at the interface of Voss' catalyst layer and solid polymer ion exchange membrane. Even if true, which Applicants do not concede, claim 75 requires more than just mere surface mixing. Claim 75 has been amended to more specifically recite that the ion conducting material is admixed with the catalyst component in the catalytic material. Applicants respectfully submit that the surface mixing alleged by the Examiner would be insufficient to meet this claim limitation.

Dhar is similarly deficient. Dhar describes thin catalyst layers deposited on the electrodes. See Dhar, col. 4, lines 42-59. Again, no materials (including an ion conducting material as required by instant claim 75) are contemplated as being admixed with the catalytic material in the preparation of the catalyst layers.

Thus, Applicants respectfully request withdrawal of the rejection of claim 75 as obvious over Voss and Dhar.

CONCLUSION

The Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. Should any issues remain open after consideration of the present amendment and reply, the Examiner is invited to contact the undersigned so that a prompt disposition of the application may be achieved.

The Commissioner is hereby authorized to charge any fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any additional extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorize payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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